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# A COMMODIFLOW MODEL FOR AN EXCLAVE REGION: RENT-SEEKING IN THE «TRANSITIONAL PERIOD» OF THE SPECIAL ECONOMIC ZONE

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*This article focuses on a commodity flow model for an exclave region (CFMER). The CFMER development is aimed at identifying aggregate proportions of the exclave's economy in the transitional period of the special economic zone (SEZ) functioning. The key method of analysis is the comparison of data on the generation of gross regional product and regional foreign economic activities (including export and import of goods and moving goods from/into the Kaliningrad region to other Russian regions). It results in a conceptual CFMER, which is assessed as of 2011. The availability of additional — as compared to a regular region — data on commodity flows in the framework of the SEZ transitional period makes it possible to identify structural disproportions in the economy. It is shown that the introduction of the SEZ transitional period did not result in a change in the conceptual model of the regional economy's functioning merely increasing the opportunities for rent extraction. The authors predict structural imbalances in the exclave economy at the microlevel, in particular, the article analyses the conceptual model of rent extraction in the SEZ transitional period. The CFMER can be used for forecasting the development of exclave's economy under different scenarios of the evolution of SEZ in the Kaliningrad region.*

**Key words:** exclave, Kaliningrad region, special economic zone, export, import, inter-regional trade, commodity flow model

## Introduction

The unique characteristics of the Kaliningrad region as an exclave territory have been a topic for much discussion (see, for example, [24; 21; 17; 16; 7; 2, etc.]). In the transitional period of the Kaliningrad SEZ functioning, one of the most remarkable features of the exclave economy — as opposed to that of an ordinary region — is the availability of an additional information

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base [15]. These data make it possible to build a commodity flow model for an exclave region (CFMER).

Despite the limitations imposed on the study by both the accuracy and completeness of data and the need to use heuristic methods and expert evaluations, the CFMER is an important starting point for understanding the patterns of the exclave economy's functioning. An interesting aspect is the monitoring of deformations caused by the mechanisms of extracting the transitional period rent (forecast at the microlevel) at the level of regional economy [3].

The structure of this article is as follows. At first, the general structure of the desired model is described. Then, the CFMER methodology and data sources are introduced. The 2011 model is evaluated and the problems of its development (deviations from the 'desired' model) are presented. Finally, the 2001 and 2003 CFMERs are compared [17]. The comparison makes it possible to come to certain conclusions as to the efficiency of the SEZ transitional period, sources of rent creation at the microlevel and their identification at the level of aggregations. In the conclusion, further areas of research and its practical applications are outlined.

### **Development of a commodity flow model for an exclave region**

Complex multi-aspect regional models — for example, IMPLAN and REMI — have been developed earlier [12; 11; 8]. Russian complex models include "Prognoz" and the "Region" automated information system.

The modelling of a regional economy is always complicated by the lack of initial data. However, principal approaches to the development of a regional economic policy have been described in detail [5; 13; 18; 14; 22; 19; 20, etc.]. The key problem encountered in practice is the accumulation of reliable data and model calibration (which is largely influenced by the state system and the availability of regional data).

Complications in selecting and adjusting regional models relate to the objectives set by researchers and practical specialists and, therefore, to different levels of parameter specification (see, for example, [1; 4; 9; 6; 10]).

This study sets out to construct an aggregated model that will make it possible to visually present the features of the exclave region's economy and forecast different scenarios of its development. First of all, we are interested in identifying patterns in the functioning of the economy of the transitional SEZ period forecast at the microlevel.

An aggregate commodity flow model is a visual model of a regional system using elements of interregional trade flows (*trade flow model*) and production accounts at the regional level.

The model is designed to analyse economic proportions and aggregations developing in the Kaliningrad region under the impact of the special economic zone regime (for more detail on the SEZ functioning see, for example, [23]). Fig. 1 shows the timeline of the extended SEZ regime; a system of symbols will help to distinguish between different economic models functioning in the exclave region.

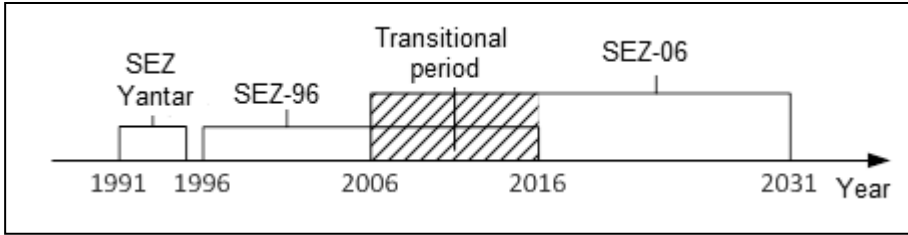


Fig. 1. Evolution of the SEZ regime in the Kaliningrad region

Source: [3].

We are using a simplified system of signs to designate the key stages and features of the SEZ functioning to demonstrate that two essentially different regimes with a technically similar name exist in the framework of the transitional period.

Cooperation of individual firms in the framework of SEZ-96 and SEZ-06 in view of the transfer pricing mechanism makes it possible for hybrid company structures (groups) to significantly reduce a tax burden [15]. The development of hybrid forecast at the microlevel gives an opportunity to create additional economic rent of the transitional SEZ period according to the following scheme (fig. 2), where  $C$  is the cost of imports;  $A$  — ad valorem percentage;  $\tau$  — customs duty;  $T$  — profit tax;  $\pi$  — profit.

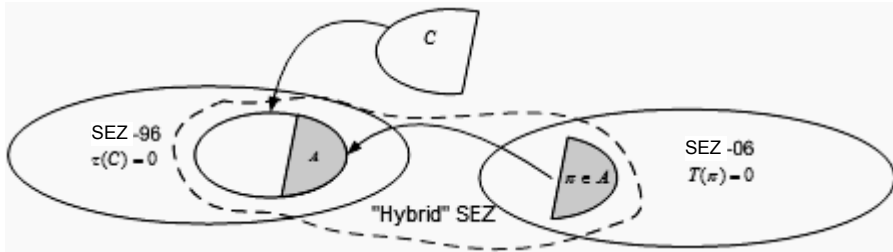


Fig. 2. A basic model of rent extraction in the transitional SEZ period

It is possible to demonstrate that the objective of tax burden optimisation (maximisation of total gains) is achieved through using the hybrid structure.

To understand how the microlevel model can be translated to the regional level, it is necessary to observe similar variables in an aggregated form. To this end, we will use the CFMER.

However, before proceeding to the analysis of the exclave region, let us consider the principal model of commodity flows for the economy of a typical *internal* region (fig. 3). Commodity flows were chosen as the basic parameter of the model, since the corresponding statistics is the most available. (The model of services flows is rather similar. However, as a rule, it is simpler and based on less reliable data.)

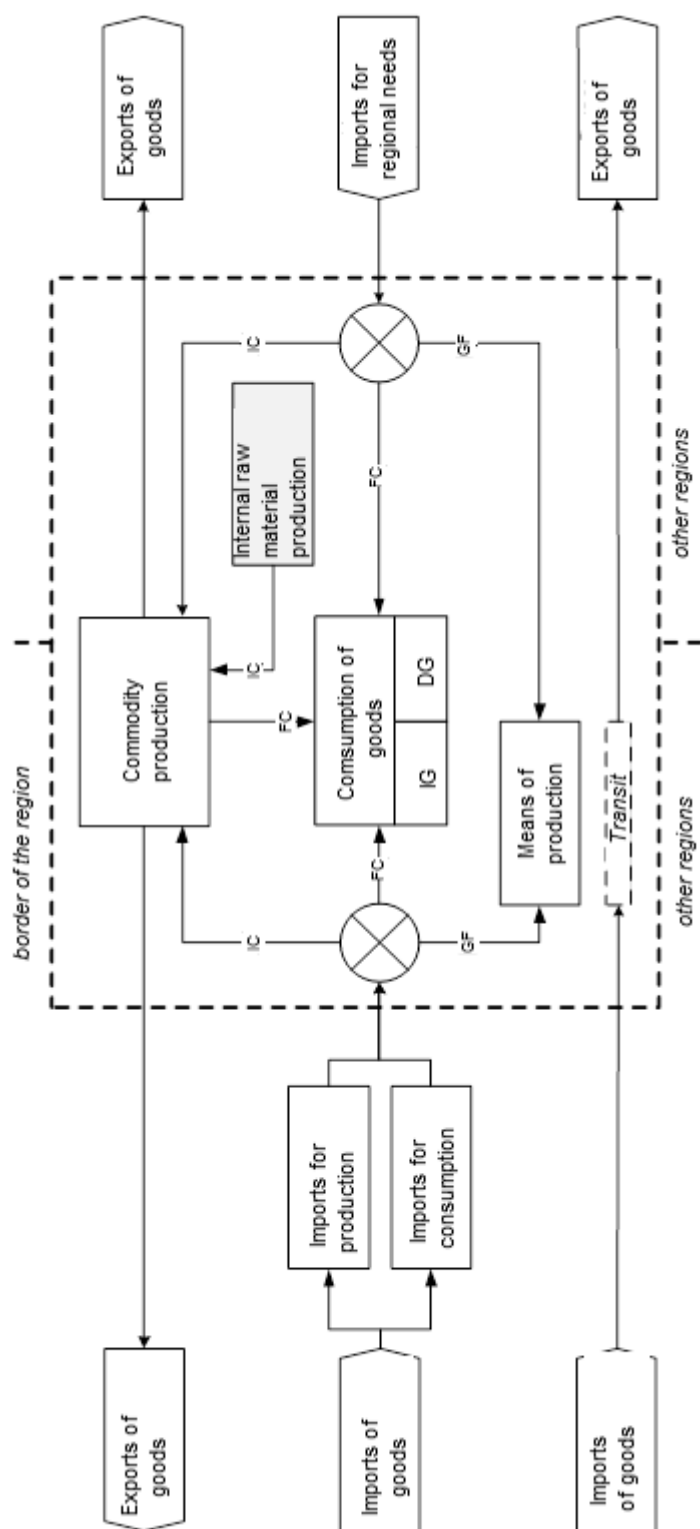


Fig. 3. A typical model of regional commodity flows

Legend: IG — imported goods; DG — domestic goods; FC — final consumption; IC — intermediate consumption; GF — gross capital formation.

An advantage of the developed model is its visual clarity and the possibility of its use both by researchers and practical specialists. Moreover, the selected level of aggregation makes it possible to understand the major proportions characterising the region's economy even if we assume the existence of mistakes and errors of estimation of the absent parameters.

The model is based on the *balance* principle. The key internal sectors (industrial production, raw material production, investment and consumption) ensure a balance between commodity flows in view of the limitations of the basic correlation:

$$VA = \text{Output} - IC,$$

where VA is gross value added (a component of gross product).

VA can be calculated for the production sector. The role of *limitations* can be played by any known parameter, for instance, data on exports and imports of goods and VA, investment and final consumption.

The most complex elements of the model are the nodes ( $\otimes$ ), since the end use of commodity flows, raw materials and components cannot be identified on the basis of statistical reports. Another non-standard task is the division of flows into imports and domestic goods within the consumption structure. However, we can use heuristic methods to identify the most feasible combination of flows within nodes based on an analysis of limitations set by more reliable data. These methods are necessary to identify the coefficients of flow division.

The transitional SEZ period gives an opportunity to include more details in the model of the exclave region's economy.

As fig. 4 shows, the existence of SEZ, which uses the free customs zone (FCZ) regime, does not only "duplicate" the manufacturing sector but also ramifies foreign economic flows.

Strangely enough, a visually more complex model makes it easier to monitor the flows, since the exclave region offers a more extensive information base than a regular internal region. Additional registers make it possible to compare disaggregated data from a large number of sources. Thus, the presented experimental model is a simplification of the full version of CFMER.

### **The data collection methodology and the experimental model**

Due to its unique features, the Kaliningrad region is often considered in different studies. However, the key patterns of its development have not been described in detail. Using the CFMER, we can make an attempt at an experimental assessment of the structural proportions of the Kaliningrad regional economy for a certain year.

The methodology of CFMER development includes the following stages:

1. A comparison of international economic activity (IEA) statistics and customs foreign trade statistics based on customs procedures<sup>1</sup>.

<sup>1</sup> Codes of customs procedures (Appendix 1 to the Decision of the Customs Union Commission of 29.09.2010 No 378).

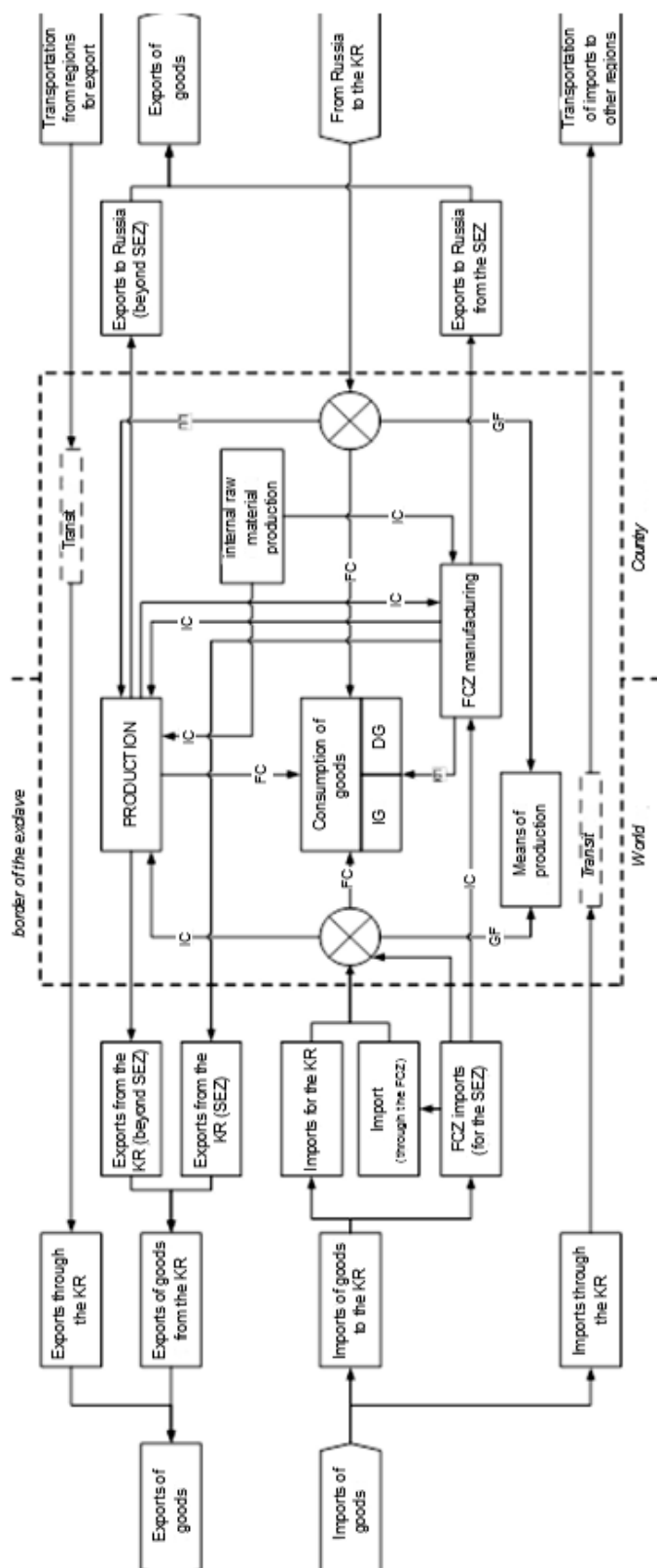


Fig. 4. A theoretical model of commodity flows for an exclave region (CFMER)

2. An analysis of the “production account” statistics: data on commodity production and structure of value added creation according to the Russian Classification of Economic Activities (RCEA).
3. An analysis of statistical data on intermediate consumption (input into production, restoration of a part of regional input-output balance).
4. An analysis of data on the transportation of goods into (and from) the region from (and into) other regions.
5. An analysis of data on companies’ sales for the reporting period according to the Russian Classification of Economic Activities.
6. A comparison of data from different analytical registers according to the Russian Classification of Economic Activities.
7. An analysis of data on the structure of consumer spending aimed to identify the limitations on domestic consumption.
8. Expert evaluations of coefficients relating to the consumption structure (based on a survey of representatives of large chains controlling a significant part of the wholesale and retail market).
9. An assessment of internal flows in view of the existing internal and external limitations. It is reasonable to use the actual ad valorem percentage of manufacturing in the SEZ regime as a calibration parameter.
10. Testing the model for compliance with additional limitations that are not included in the model. An analysis of deviations and adjustment of estimates.

The application of the methodology to the available data [29—30] has produced the following CFMER for 2001 (see fig. 5).

Apparently, commodity flows differ from trade flows by the magnitude of services flows. At this stage, we deliberately bypass the services sector to use more reliable variables that characterise commodity flows. Fortunately, almost all statistical registers clearly distinguish between commodity and services flows. Thus such an approach does not create complications and is held to be justified.

The division between commodities and services is relevant to all analysed forms. The annual average USD exchange rate according to the data of the Bank of Russia<sup>1</sup> is used as the currency exchange rate. For visual clarity and comparability of indicators, the *analytical registers* (based on statistical data) use the scale of billion USD.

Differences in information presented in accounting registers, possible deviations stemming from currency translation and complications with accounting for certain industries (for instance, the cost of electricity exports) lead to further deviations. Therefore, there is a need to introduce a number of balancing items (for example, transit estimates). In any case, aggregated data of statistics on foreign economic activities as to imports of goods and value added indicate that the value added in industrial production does not meet the SEZ-06 requirements. However, this paradox was observed earlier: if, at the microlevel, a company manages to prove the sufficiency of value added, aggregated indicators always demonstrate a deficit thereof.

<sup>1</sup> The calculations uses the exchange rate of 1 USD = 29.3775 roubles.



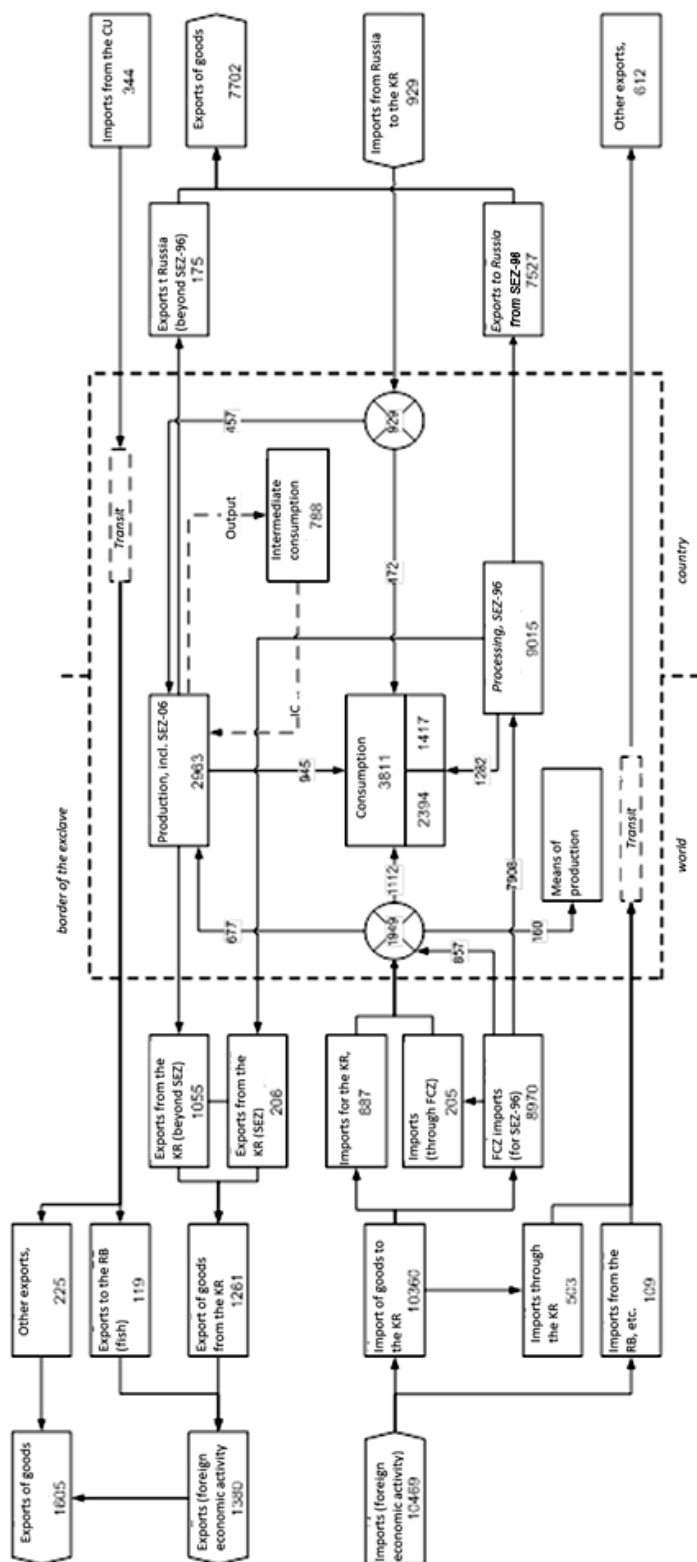


Fig. 5. An experimental assessment of the 2011 CFMER, million USD

*Comments:* Some boxes of the theoretical CFMER were removed or modified.

We use partial information from sections E, F and C of the Russian Classification of Economic Activities (and, therefore, a limited share of capital formation) because of the defects of statistical recording<sup>1</sup>. Moreover, we have to adjust exports of goods upward, since information on the SEZ goes beyond the scope of economy presented in the statistics on international economic activity<sup>2</sup> (the observational error is assessed at 10%, which is a significant percentage).

When considering data on the GRP structure in terms of revenue and output (turnover data are given for reference)<sup>3</sup>, one can make several observations (table 1). In the structure of net axes, mineral extraction accounts for 57%. Technically, manufacturing industries account for only 9% of net taxes (however, with 19%, they retain top position in terms of social taxes), whereas transport and communications account for 11%. Nevertheless, D section creates 28% of gross margin aside from 7% of the “production” margin presented in section K. It is worth noting that, under the SEZ-06 regime, a significant part of the services sector (for instance, in the real estate industry) was classed under “manufacturing industries”, since part of value added in industrial production (in the form of hybrid structure revenue) “turns up” in the services sector<sup>4</sup>.

Table 1

**Basic data on the structure of 2011 GRP of the Kaliningrad region,  
million USD (rounded to the nearest whole number)**

RCEA code	Turn-over	Output		VA				
		Total	IC	Total	Remuneration	Social taxes	Taxes	Profit
<i>Total</i>	20 772	20 034	12 272	7 762	2 433	730	302	4 297
A Agriculture	232	656	270	386	44	13	5	324
B Fishing	233	308	155	153	25	8	1	119
C Mineral extraction	623	635	165	471	47	16	173	234
D Manufacturing industry	9 118	9 458	7 748	1 710	344	141	26	1 200
E Electricity, gas, water	1 067	921	578	343	107	48	19	167

<sup>1</sup> For instance, the lack of reliable data on the volume of electricity exports and distribution of value added in this activity.

<sup>2</sup> At the federal level, the volume of trade is linked to customs statistics, household data and trade resources through preparing a balance sheet for commodity supply of retail turnover. At the regional level, the level of retail turnover should correspond to the indicators of household statistics relating to consumer spending on goods [25].

<sup>3</sup> Companies' turnover includes the cost of locally produced shipped goods and services provided by them, as well as revenues from selling goods purchased from the third party (without VAT, excise taxes and similar obligatory payments).

The output of goods and services is the integrated cost of goods and services produced as a result of activities of resident economic entities in the reporting period. The output of retail and wholesale trade is measured by a markup. Production account reflects operations relating to the production process [25].

<sup>4</sup> At the microlevel, a vivid example is the SEZ-06 residents involved in industrial development.

*The end of table 1*

RCEA code		Turn-over	Output		VA				
			Total	IC	Total	Remuneration	Social taxes	Taxes	Profit
F	Construction	985	1 139	680	459	192	72	4	191
G	Retail and wholesale trade	5 650	2 330	993	1 338	288	103	9	938
H	Hospitality	142	252	142	110	25	9	1	75
I	Transport and communications	1 291	1 356	706	650	287	111	33	219
J	Finances	12	13	5	8	0	0	0	8
K	Real estate industry	1 172	1 188	239	949	145	50	22	732
L	Public administration	15	790	254	536	473	43	2	18
M	Education	51	341	112	229	177	42	3	6
N	Healthcare	91	484	162	322	227	59	1	35
O	Other services	91	163	64	99	51	16	2	30

*Comment:* certain sums can differ as a result of rounding.

*Source:* [29; 30] and the authors' calculations.

Another remarkable fact is that public administration accounts for 19 % of factor incomes in the form of remuneration (the social sector accounts for 44 % of the payroll fund).

A cost-benefit analysis and an analysis of tax burden characteristic of the existing economic model shows that the SEZ makes it possible for individual business groups to create additional transitional period rent of more than 1,000m dollars per year. This model does not give resident companies enough impetus to continue operation after the first six years of tax exemptions. One can expect gradual closure and reorganisation of companies that worked in the SEZ-06 period of the most significant privileges. In 2013, the process of establishing new SEZ-06 residents almost stopped.

### **A comparison of models before and after the transitional SEZ period**

Since 1991, the formation and functioning of the exclave territory have been intertwined with the extended concept of special economic zone (SEZ).

First of all, we are interested in the effects brought about by the transformation of the CFMER in the framework of the transitional SEZ period in the Kaliningrad region in 2006—2016.

The relevance of this work is explained by that the transitional SEZ period will end in two years and a comprehensive statistical picture emerges with a one-year lag. Therefore, there is a possibility not only to document the processes occurring at this unique stage of SEZ development but also to prepare forecasts and recommendations for its further development until 2031.

However, we can conduct an express analysis of the transitional period effects through a comparison of commodity flows of the SEZ-06 and transitional periods. A simplified commodity flow model was developed by T. R. Gareev and G. M. Fedorov in 2004 (fig. 6).

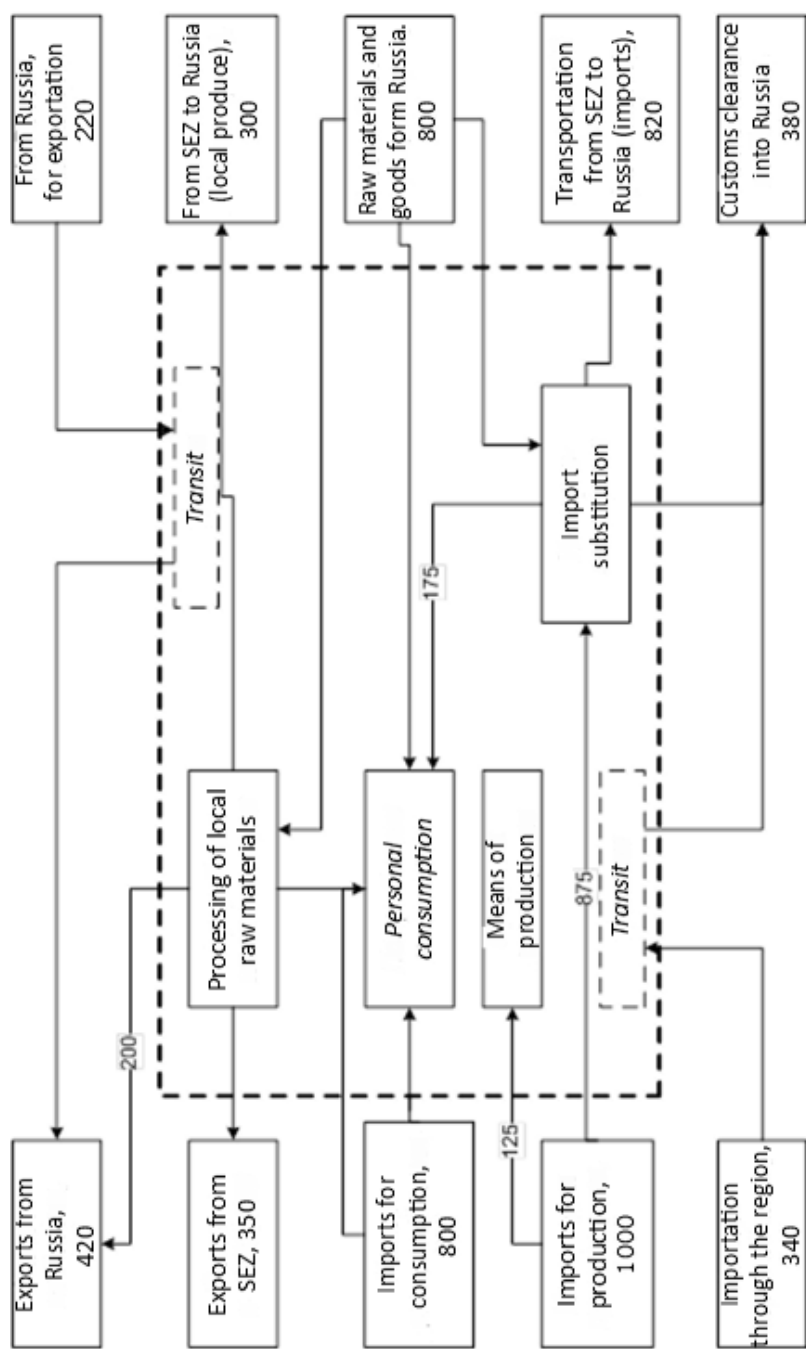


Fig. 6. Commodity flow mode for the Kaliningrad region (2003), million USD

Source: [17, p. 87].

Unfortunately, the available 2003 statistical database is less extended. However, the key variables describing the functioning of the SEZ regime are presented in the old model. Despite a change in statistical methods, the classification of industries and international economic activities, as well as the overall structure of the exclave economy, remained the same.

A significant increase was observed in the volume of imports “pumped” through the region. As the microlevel analysis forecast, the import substitution specialisation of the region expanded [3], though, technically, the percentage of value added slightly increased (it was a result of stricter requirements to processing contribution of regional companies as well as due to a convenient mechanism of creating value added through a company’s gross profit margin, which is especially true for the SEZ-06 residents).

The results of the SEZ functioning in the transitional period are demonstrated in figure 7. The chart shows that, as to imports of goods, the Kaliningrad region performs better than a notional region that equals 1 % of the national values<sup>1</sup>. However the region lags behind in terms of exports. As of 2012, approximately 4% of the national imports of goods crossed the Kaliningrad region.

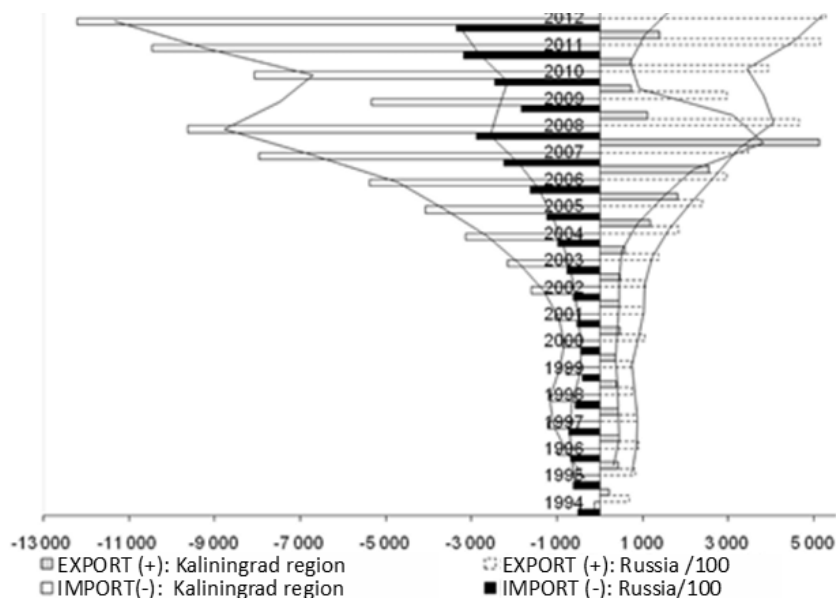


Fig. 7. International trade in goods in the Kaliningrad region and the RF, million USD

Source: [3; 29—31].

The actual scale of the regional economy has not significantly changed, predominantly due to public investment. Since most hybrid structures are

<sup>1</sup> Such comparisons seem to be justified, since the regional values for some measures are of a similar magnitude.

“enclave” growth points, their impact on the socioeconomic development of the territory is rather limited (as a rule, it is reduced to a multiplier effect from the creation of new jobs in the regional economy).

## Conclusion

The exclave economy is a unique testing site for economic modelling. Firstly, it is a result of the unique properties of the territory (its compactness and relevant simplicity of technological patterns). Secondly, it relates to the availability of a unique additional statistical database (due to special accounting regimes and a clear demarcation of the regional border). We have used these properties of the economic system to build the CFMER.

A distinguishing feature of the study is that we can identify the SEZ-06 subsystem in the framework of the regional economy in general and, additionally, examine commodity flows of the exclave territory due to the transitional period of the SEZ-96 regime. This modelling will not be possible after 2015 (since the necessary sections of customs statistics are not likely to be kept anymore).

Therefore, the results of this study are of dual use. On the one hand, it is possible to document a remarkable economic phenomenon. On the other hand, we present a methodology of producing a more detailed balance sheet for the exclave region's flows as of 2011 to prepare an estimation for the whole 2010—2015 period and monitor the dynamic effects of the extended SEZ. It will also help to create a model that would make it possible to forecast the consequences of the “2016 problem” in different scenarios.

Further research should focus on the calibration, adjustment and extension of the CFMER, which represents a new step on the way to creating a fully-fledged economic and mathematical model of the exclave.

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